

WHAT IS CLAIMED IS:

1. A method for acquiring information in relation to a device including a substrate and a plurality of materials disposed on a surface of said substrate from said surface of said device using time of flight secondary ion mass spectrometry, including at least the steps of:

irradiating pulsed primary ion beam on different positions of said surface of said biochip in a discontinuous pattern, and said primary ion beam having a spot size of smaller area than an area to be measured on said surface of said device;

conducting mass-analysis of secondary ions via time of flight, said secondary ion being generated by irradiating said pulsed primary ion beam; and

reconstructing analyzed results obtained by conducting said mass-analysis to form a two-dimensional information on the basis of said pattern of said irradiating pulsed primary ion beam.

2. The method according to claim 1, wherein said discontinuous pattern is selected to be a two-dimensionally random pattern.

3. The method according to claim 1, wherein said

discontinuous pattern is selected to be a specifically programmed pattern.

4. The method according to claim 1, wherein an ion species of said primary ion beam is gold ion ( $\text{Au}^+$ ,  $\text{Au}_2^+$ ,  $\text{Au}_3^+$ ).

5. The method according to claim 1, wherein the acquisition of information from the device surface is conducted by a combination of scanning of the primary ion beam and positional scanning of said substrate itself.

6. The method according to claim 1, wherein the device is a chip, on which biological-related materials are disposed.

7. The method according to claim 6, wherein said biological-related material is nucleic acid.

8. The method according to claim 7, wherein the nucleic acid is selected from the group consisting of DNA and RNA.

9. The method according to claim 8, wherein the DNA is selected from the group consisting of oligodeoxynucleotides, polydeoxynucleotides and cDNA (complementary DNA).

10. The method according to claim 6, wherein said biological-related material is PNA (peptide nucleic acid).

11. The method according to claim 6, wherein said biological-related material is protein.

12. The method according to claim 7, wherein the secondary ion species generated by said primary ion beam includes at least species derived by the fragmentation and ionization of phosphate backbone derived from nucleic acid.

13. The method according to claim 12, wherein the secondary ion species generated by said primary ion beam includes at least any one of  $P^-$ ,  $PO^-$ ,  $PO_2^-$  and  $PO_3^-$ .

14. The method according to claim 8, wherein the secondary ion species generated by said primary ion beam includes at least species derived by the fragmentation and ionization of nucleic acid base.

15. The method according to claim 14, wherein the secondary ion species generated by said primary ion beam includes at least any one of (adenine-H) $^-$ , (thymine-H) $^-$ , (guanine-H) $^-$ , (cytosine-H) $^-$  and (uracil-H) $^-$ .

16. The method according to claim 10, wherein the secondary ion species generated by said primary ion beam includes at least species derived by the fragmentation and ionization of peptide backbone.

17. The method according to claim 11, wherein the secondary ion species generated by said primary ion beam includes at least species derived by the fragmentation of amino acid residual group and species derived by the ionization of amino acid residual group.

18. The method according to claim 1, wherein said apparatus of time of flight secondary ion mass spectrometry for the use in the method is selected to be a reflectron type apparatus in which the measurement is carried out while said substrate is held in a condition of electrically grounded.

19. A method for analyzing components of a biological-related material disposed on a biochip in relation to the biochip, which includes a substrate, and a plurality of biological-related materials disposed on a surface of said substrate from said surface of said biochip using time of flight secondary ion mass spectrometry, including at least

the steps of:

irradiating pulsed primary ion beam on said surface of said biochip in a discontinuous pattern, and said primary ion beam having a spot size of smaller area than an area to be measured on said surface of said biochip;

conducting mass-analysis of secondary ions via time of flight, said secondary ion being generated by irradiating said pulsed primary ion beam;

reconstructing analyzed results obtained by conducting said mass-analysis to form a two-dimensional information on the basis of said pattern of said irradiating pulsed primary ion beam; and

conducting component-analysis of the biological-related material of a necessary portion contained in the obtained two-dimensional image on the basis of the mass spectrum information of said necessary portion.

20. An apparatus for acquiring information in relation to a biochip including a substrate and a plurality of biological-related materials disposed on a surface of said substrate from said surface of said biochip using time of flight secondary ion mass spectrometry, including at least:

a means for irradiating pulsed primary ion beam on said surface of said biochip in a discontinuous pattern, said surface of said biochip having said biological-related

material disposed thereon, and said primary ion beam having a spot size of smaller area than an area to be measured on said surface of said biochip;

a means for conducting mass-analysis of secondary ions via time of flight, said secondary ion being generated by irradiating said pulsed primary ion beam; and

a means for reconstructing analyzed results obtained by conducting said mass-analysis to form a two-dimensional information on the basis of said pattern of said irradiating pulsed primary ion beam.